

### **Amendments to the Claims:**

Please amend the claims as follows. This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1. (Currently amended) A method of operating a frequency synthesizer, comprising:  
detecting a phase difference between an output signal of a controlled oscillator and a reference signal, the output signal exhibiting a frequency and phase;  
pumping first charge, in response to the phase difference, into a first filter which is configured as a direct path loop filter;  
pumping second charge, in response to the phase difference, into a second filter having substantially the same topology as the first filter, the second filter being configured as an integrating path loop filter; ~~and~~  
providing a signal from the first and second filters to the controlled oscillator to control the frequency and phase of the output signal of the controlled oscillator; and  
decoupling the controlled oscillator from the first filter while first charge is pumped into the first filter.
2. (Canceled)
3. (Currently amended) The method of claim 1 further comprising decoupling the controlled oscillator from the second filter while second charge is pumped into the second filter.
4. (Original) The method of claim 1 wherein the first filter is a switched capacitor filter.

5. (Original) The method of claim 1 wherein the second filter is a switched capacitor filter.
6. (Currently amended) The method of claim 5 wherein the switched capacitor filter includes a disabled switched capacitor ~~which is disabled~~.
7. (Original) The method of claim 1 wherein the first filter and the second filter are substantially matched with one another.
8. (Original) The method of claim 1 further comprising combining, within the controlled oscillator, an output signal of the first filter with an output signal of the second filter.
9. (Original) The method of claim 1 further comprising combining, external to the controlled oscillator, an output signal of the first filter with an output signal of the second filter.
10. (Original) The method of claim 1 wherein the controlled oscillator is a voltage controlled oscillator.

11. (Currently amended) A frequency synthesizer, comprising:
- a controlled oscillator;
  - a phase detector that detects a phase difference between an output signal of the controlled oscillator and a reference signal, the output signal exhibiting a frequency and phase;
  - a charge pump, coupled to the phase detector, that pumps first charge at a first charge pump output and second charge at a second charge pump output outputs;
  - a direct path loop filter, coupled to the first charge pump output and the controlled oscillator;
  - an integrating path loop filter, coupled to the second charge pump output and the controlled oscillator, the integrating path loop filter having substantially the same topology as the direct path loop filter;
  - the direct path loop filter and the integrating path loop filter providing a signal to the controlled oscillator to control the frequency and phase of the output signal of the controlled oscillator, the direct path loop filter including a first switch that decouples the direct path loop filter from the controlled oscillator while the charge pump pumps first charge into the direct path loop filter.
12. (Canceled)
13. (Currently amended) The frequency synthesizer of claim 11 wherein the integrating path loop filter includes a second switch that decouples the integrating path loop filter from the controlled oscillator while the charge pump pumps second charge into the integrating path loop filter ~~controlled oscillator is decoupled from the integrating path loop filter while charge is pumped into the integrating path loop filter.~~

14. (Original) The frequency synthesizer of claim 11 wherein the direct path loop filter is a switched capacitor filter.
15. (Original) The frequency synthesizer of claim 11 wherein the integrating path loop filter is a switched capacitor filter.
16. (Currently amended) The frequency synthesizer of claim 15 wherein the switched capacitor filter includes a disabled switched capacitor ~~which is disabled~~.
17. (Original) The frequency synthesizer of claim 11 wherein the direct path loop filter and the integrating path loop filter are substantially matched with one another.
18. (Original) The frequency synthesizer of claim 11 wherein the controlled oscillator includes a combiner which combines signals from the direct path loop filter and the integrating path loop filter.
19. (Original) The frequency synthesizer of claim 11 further comprising a combiner external to the controlled oscillator which combines signals from the direct path loop filter and the integrating path loop filter.
20. (Original) The frequency synthesizer of claim 11 wherein the controlled oscillator is a voltage controlled oscillator.

21. (Currently amended) A wireless communication system, comprising:  
a frequency synthesizer including:  
    a controlled oscillator;  
    a phase detector that detects a phase difference between an output signal of the controlled oscillator and a reference signal, the output signal exhibiting a frequency and phase;  
    a charge pump, coupled to the phase detector, that pumps first charge at a first charge pump output and second charge at a second charge pump output outputs;  
    a direct path loop filter, coupled to the first charge pump output and the controlled oscillator;  
    an integrating path loop filter, coupled to the second charge pump output and the controlled oscillator, the integrating path loop filter having substantially the same topology as the direct path loop filter;  
    the direct path loop filter and the integrating path loop filter providing a signal to the controlled oscillator to control the frequency and phase of the output signal of the controlled oscillator, the direct path loop filter including a first switch that decouples the direct path loop filter from the controlled oscillator while the charge pump pumps first charge into the direct path loop filter; and  
a mixer circuit, coupled to the frequency synthesizer, to mix an input signal with the output signal of the controlled oscillator of the frequency synthesizer.

22. (Canceled)

23. (Currently amended) The wireless communication system of claim 21 wherein the integrating path loop filter includes a second switch that decouples the integrating path loop filter from the controlled oscillator while the charge pump pumps second charge into the integrating path loop filter ~~controlled oscillator is decoupled from the integrating path loop filter while charge is pumped into the integrating path loop filter.~~
24. (Original) The wireless communication system of claim 21 wherein the direct path loop filter is a switched capacitor filter.
25. (Original) The wireless communication system of claim 21 wherein the integrating path loop filter is a switched capacitor filter.
26. (Currently amended) The wireless communication system of claim 25 wherein the switched capacitor filter includes a disabled switched capacitor ~~which is disabled.~~
27. (Original) The wireless communication system of claim 21 wherein the direct path loop filter and the integrating path loop filter are substantially matched with one another.
28. (Original) The wireless communication system of claim 21 wherein the controlled oscillator includes a combiner which combines signals from the direct path loop filter and the integrating path loop filter.
29. (Original) The wireless communication system of claim 21 further comprising a combiner external to the controlled oscillator which combines signals from the direct path loop filter and the integrating path loop filter.

30. (Original) The wireless communication system of claim 21 wherein the controlled oscillator is a voltage controlled oscillator.
31. (Currently amended) A frequency synthesizer integrated circuit (IC) having at least one variable frequency output, comprising:
- ~~a substrate on which components of the IC are disposed;~~
  - a controlled oscillator;
  - a phase detector that detects a phase difference between an output signal of the controlled oscillator and a reference signal, the output signal exhibiting a frequency and phase;
  - a charge pump, coupled to the phase detector, that pumps first charge at a first charge pump output and second charge at a second charge pump output outputs;
  - a direct path loop filter, coupled to the first charge pump output and the controlled oscillator;
  - an integrating path loop filter, coupled to the second charge pump output and the controlled oscillator, the integrating path loop filter having substantially the same topology as the direct path loop filter;
  - the direct path loop filter and the integrating path loop filter providing a signal to the controlled oscillator to control the frequency and phase of the output signal of the controlled oscillator, the direct path loop filter including a first switch that decouples the direct path loop filter from the controlled oscillator while the charge pump pumps first charge into the direct path loop filter; and
  - a substrate on which the controlled oscillator, phase detector, charge pump, direct path loop filter and integrating path loop filter are situated.
32. (Canceled)

33. (Currently amended) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the integrating path loop filter includes a second switch that decouples the integrating path loop filter from the controlled oscillator while the charge pump pumps second charge into the integrating path loop filter ~~controlled oscillator is decoupled from the integrating path loop filter while charge is pumped into the integrating path loop filter.~~
34. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the direct path loop filter is a switched capacitor filter.
35. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the integrating path loop filter is a switched capacitor filter.
36. (Currently amended) The frequency synthesizer integrated circuit (IC) of claim 35 wherein the switched capacitor filter includes a disabled switched capacitor ~~which is disabled.~~
37. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the direct path loop filter and the integrating path loop filter are substantially matched with one another.
38. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the controlled oscillator includes a combiner which combines signals from the direct path loop filter and the integrating path loop filter.
39. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 further comprising a combiner external to the controlled oscillator which combines signals from the direct path loop filter and the integrating path loop filter.



40. (Original) The frequency synthesizer integrated circuit (IC) of claim 31 wherein the controlled oscillator is a voltage controlled oscillator.

41. (Currently amended) A frequency synthesizer, comprising:

a phase detector, ~~the phase detector~~ configured to detect and output a phase difference between first and second two phase detector input signals;

a charge pump, coupled to the phase detector, the charge pump configured to supply first charge to a first charge pump output and second charge to a second charge pump output ~~derive first and second output signals from the output of the phase detector~~;

a direct path filter coupled to the first charge pump output, the direct path filter configured to filter the first output signal of the charge pump to produce a first filtered signal;

an integrating path loop filter coupled to the second charge pump output, the integrating path loop filter configured to filter the second output signal of the charge pump to produce a second filtered signal; and

a combiner coupled to the direct path loop filter and to the integrating path loop filter, the combiner configured to combine the first and second filtered signals, the direct path loop filter including a first switch that decouples the direct path loop filter from the combiner while the first charge pump output supplies the first charge to the direct path loop filter, the integrating path loop filter including a second switch that decouples the integrating path loop filter from the combiner while the second charge pump output supplies the second charge to the integrating path loop filter.

42. (Canceled)

43. (Canceled)

44. (Canceled)

45. (Canceled)

46. (New) The frequency synthesizer of claim 41 further comprising a voltage controlled oscillator (VCO) coupled to the combiner, the VCO providing a VCO output signal.

47. (New) The frequency synthesizer of claim 46 wherein the first phase detector input signal is a reference frequency signal and the second phase detector input signal is the VCO output signal.